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LACQUER AND CHEMICAL CORP., ALAKA RESEARCH LABS., BROOKLYN,
N.Y. (4TH QUARTERLY REPORT)

FOURTH QUARTERLY REPORT ON FUNGUS RESISTANCE OF PLASTICS -
NOV 17, 1951 TO FEB 8, 1952

RUGGERI, S.; ATLAS, R. WAITZE 15 FEB '52 71PP TABLES

USN CONTR. NO. NORD 11215

PLASTICS - EFFECT OF FUNGI MATERIALS, NON-METALLIC (8)
FUNGI PLASTICS (2)

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FOURTH QUARTERLY REPORT

on

FUNGUS RESISTANCE OF PLASTICS

to

BUREAU OF ORDNANCE
DEPARTMENT OF THE NAVY
MOISTURE AND FUNGUS PROOFING SECTION
MATERIALS AND PRESERVATION BRANCH
RESEARCH AND DEVELOPMENT DIVISION

CONTRACT NOrd 11215

by

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Period covered: November 17, 1951 to February 8, 1952

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FUNGINERTNESS OF PLASTIC LAMINATES
(PETRI-DISH METHOD)

Introduction

Further work completed under this study has been a continuation of tests of fungus resistance of available plastic laminated materials following the Petri-Dish culture test procedure as outlined in the "Funginertness Requirement and Test, for use in MIL-I-631A (as completed 29 January 1951)", furnished by the Bureau of Ordnance with letter dated 16 February 1951. Earlier work covering the phase of the study was reported in the First Quarterly Report (pages 4 - 25), the Second Quarterly Report (pages 28-77), and the Third Quarterly Report (pages 124-136).

Materials

The materials evaluated in this study include the following laminated, thermosetting, plastic materials as approved under the following specifications:

<u>Specification</u>	<u>Type</u>	<u>Filler</u>	<u>Resin</u>	<u>Grade</u>
MIL-P-997A	GSG	Glass Cloth	Silicone	General
MIL-P-15037A	GMG	Glass Cloth	Melamine	General
MIL-P-15047A	NPG	Nylon Cloth	Phenolic	General
MIL-P-3115A	PBG	Paper	Phenolic	General
MIL-P-3115A	PBE	Paper	Phenolic	Electrical
MIL-P-3115A	PBE-P	Paper	Phenolic	Electrical
MIL-P-15035A	FBM	Cotton Fab.	Phenolic	Punching
MIL-P-15035A	FBG	Cotton Fab.	Phenolic	Mechanical
MIL-P-15035A	FBE	Cotton Fab.	Phenolic	General
MIL-P-15035A	FBI	Cotton Fab.	Phenolic	Electrical
			Phenolic	Fine Machining



Experimental Procedure

The experimental procedure has been explained in detail in the First Quarterly Report, pages 5, 6, and 7.

Evaluation of Results

At the end of the 21 day incubation period, each specimen was examined separately for growth on the surface and for growth on the cut edges and rated as follows:

<u>Observed Fungus growth on the specimen</u>	<u>Rating</u>
No growth	0
Traces of growth (*)	1
Slight to moderate growth: partial coverage	2
Moderate growth: considerable coverage	3
Abundant growth: complete coverage	4

(*) Traces of growth are defined as scattered, sparse fungus growth such as might develop from an unusual mass of spores in the original inoculum, or upon an occasional extraneous bit of debris. (Continuous cobwebby growth extending over the entire surface or edge of the specimen, even though not necessarily obscuring the specimen, was rated as 2.)

Table 19 pages 253 through 255, lists the observations on the individual replicates of the unconditioned specimens and the numeric rating of each replicate both for surface and edge growth. Table 20 pages 256 through 258, lists the observations on the individual replicates of the conditioned specimens and the numeric rating of each replicate both for surface and edge growth.



Interpretation of Results for Determination of Funginertness

For a material to be considered funginert it shall not support fungus growth; this shall be due to absence of nutritive substances in the material and not to presence of a fungistatic agent. The absence of a fugitive fungistatic agent was determined from the results on the specimens which received the conditioning of 6 hours at 85° C.

On the basis of the numeric rating of the fungus growth on the six specimens for each sample of plastic laminate being evaluated, the following criteria were used for the various degrees of fungus resistance:

- 1) Funginert - where at least 2 of 3 specimens were rated 0 or 1 when tested as received and at least 2 of 3 specimens were rated 0 or 1 when tested after being conditioned.
- 2) Fugitive Fungistatic - where at least 2 of 3 specimens were rated 0 or 1 when tested as received and at least 2 of 3 specimens were not rated 0 or 1 when tested after being conditioned.
- 3) Fungus Susceptible - where at least 2 of 3 specimens were not rated 0 or 1 when tested as received and at least 2 of 3 specimens were not rated 0 or 1 when tested after being conditioned.

Since it has not been determined whether these criteria will be applied to surface growth alone or to surface growth together with edge growth, separate ratings have been assigned to the specimens based on surface growth alone and on surface and edge growth considered together.



Table 21 pages 259 and 260, lists the classification, of the plastic laminates tested, based on the ratings considering surface growth alone and on the ratings considering surface growth together with edge growths.

TABLE 19

GROWTH OF FUNGUS ON PLASTIC LAMINATES
(PETRI-DISH METHOD)

Conditioning of Specimen: None

Spec. Grade	Manufacturer and Designation	Description of Fungus Growth			Numeric Rating
		Petri-dish Repli-cates	Surface	Edges (**)	
FBE #6	533A 533B 533C	Slight (*) Slight Slight	Moderate Slight Slight	2 2 2	2 2 2
PBG #7	534A 534B 534C	Slight Slight (*) Traces	Slight Slight Slight	2 2 2	2 2 2
FEM C - 525	535A 535B 535C	Abundant {**} Abundant {**} Abundant {**}	Abundant Abundant Abundant	4 4 4	4 4 4
PPE #9	595A 595B 595C	Slight (*) Slight (*) Slight (*)	Moderate Moderate Moderate	2 2 2	2 2 2
PPE #12	596A 596B 596C	Slight (*) Slight (*) Slight (*)	Moderate Moderate Moderate	2 2 2	2 2 2

*-- Specimen surface was waterlogged --game for 4 edges unless otherwise noted
 Note-- For explanation of numeric rating code see page 250

TABLE 19 (CONTINUED)
GROWTH OF FUNGUS ON PLASTIC LAMINATES
(PETRI-DISH METHOD)

Conditioning of Specimen: None

Spec. Grade	Manufacturer and Designation	Petri-dish Replicates	Description of Fungus Growth		Numeric Rating
			Surface	Edges (**)	
FBE	#12 LE -13	5554 555B 555C	Mod: Part Cov { * } Mod: Part Cov { * } Mod: Part Cov { * }	Moderate Slight Moderate	2 2 2
		#13 XXX - 13	5584 558B 558C	Traces { * } None Traces	1 0 1
		#13 LE-13	556A 556B 556C	Complete Waterlog Traces Traces	0 1 1
PBE	#14 XXXP-26	5974 597C 538C	Complete Waterlog Slight (*) Slight	Waterlog Slight Slight	0 2 2
FBE	#16 XXX	5394 539B 539C	Mod: Part Cov Slight (*) Complete Waterlog	Moderate Moderate Moderate	2 2 2

* - Specimen surface was waterlogged ** - Same for 4 edges unless otherwise noted.
Note - For explanation of numeric rating code see page 250



TABLE 19 (CONCLUDED)
GROWTH OF FUNGUS ON PLASTIC LAMINA
(PETRI-DISH METHOD)

Sheet 3 of 3

* - Specimen surface was waterlogged ** - Same for 4 edges unless otherwise noted
Note - For explanation of numbers rating code see page 250

Sheet 1 of 3

TABLE 20
GROWTH OF FUNGUS ON PLASTIC LAMINATES
(PETRI-DISH METHOD)

Conditioning of Specimen: 6 hrs at 85° C

Spec. Grade	Manufacturer and Designation	Petri-Dish Repli-cates	Description of Fungus Growth	Numeric Rating
		Surface	Edges (**)	Surface and Edges
PBE	#6 221-A	543A 543B 543C	Slight Slight Slight	Moderate Slight Moderate
PBG	#7 XX-324	544A 544B 544C	Slight Complete Waterlog Slight	Moderate Moderate Slight
FBM	#7 C-525.	545A 545B 545C	Abundant (*) Abundant Abundant	Abundant Abundant Abundant
PBE	#9 6022	602A 602B 602C	Slight (*) Slight (*) Slight (*)	Moderate Moderate Moderate
PBE	#12 XXX-13	603A 603B 603C	Mod: Part Cov (*) Mod: Part Cov (*) Mod: Part Cov (*)	Moderate Abundant Abundant

* - Specimen was waterlogged ** - Same for 4 edges unless otherwise noted
Note - For explanation of numeric rating code see page 250



TABLE 20 (CONTINUED)

GROWTH OF FUNGUS ON PLASTIC LAMINATES
(PETRI-DISH METHOD)

Conditioning of Specimen: 6 hrs at 85° C

Spec. Grade	Manufacturer and Designation	Description of Fungus Growth		Numeric Rating Surface and Edges
		Surface	Edges (**)	
PBE	#12	563A 563B 563C	Mod.; Part Cov (*) Mod.; Part Cov (*) Mod.; Part Cov (*)	Moderate Moderate Moderate
	IE-13		Traces Traces Traces (*)	None None None
				1 1 1
PBE	#13	566A 566B 566C	Traces Traces Traces (*)	None None None
	XXX-13			1 1 1
PBE	#13	564A 564B 564C	Traces (*) None (*) Traces (*)	None None None
	IE-13			1 0 1
PBE-P	#14	548A 548B 548C	Slight Slight Complete Waterlog	Slight Slight Slight
	XXXP-26			0 0 0
PBE	#16	549A 549B 549C	Complete Waterlog Slight (*) Slight (*)	Moderate Moderate Moderate
	XXX			0 2 2

* - Specimen surface was waterlogged ** - Same for 4 edges unless otherwise noted
 Note - For explanation of numeric rating code see page 250



TABLE 20 (CONCLUDED)
GROWTH OF FUNGUS ON PLASTIC LAMINA
(BEMERIDESH METHOD)

Conditioning of Specimen: 6 hrs at 85° C.

Specimen surface was waterlogged -- Same for 4 edges unless otherwise noted
Note -- For explanation of nomenclature pertaining to edge see page 250

TABLE 21
FUNGUS RESISTANCE OF PLASTIC LAMINATES
(PETRI-DISH METHOD)

Summary of more detailed data shown in tables 19 and 20.

Spec. Grade	Manufacturer and Designation	Surface Growth Only			Surface and Edge Growth		
		Numeric Rating Uncond	Numeric Rating Cond	Fungus Resistance (*)	Numeric Rating Uncond	Numeric Rating Cond	Fungus Resistance (*)
FBE	#6 221-A	2 2 2	2 2 2	Susceptible	2 2 2	2 2 2	Susceptible
PBG	#7 XX-324	2 2 1	2 0 2	Susceptible	2 2 2	2 2 2	Susceptible
FBM	#7 C-525	4 4 4	4 4 4	Susceptible	4 4 4	4 4 4	Susceptible
PBE	#9 6022	2 2 2	2 2 2	Susceptible	2 2 2	2 2 2	Susceptible
PBE	#12 XXX-13	2 2 2	2 2 2	Susceptible	2 2 2	2 3 3	Susceptible
FBE	#12 TE-13	2 2 2	2 2 2	Susceptible	2 2 2	2 2 2	Susceptible
PBE	#13 XXX-13	1 0 1	1 1 1	Funginert	1 0 1	1 1 1	Funginert
FBE	#13 TE-13	0 1 1	1 0 1	Funginert	0 1 1	1 0 1	Funginert

* See page 251 for detailed explanation.



TABLE 21 (CONCLUDED)
FUNGUS RESISTANCE OF PLASTIC LAMINATES
(PEBBLE-DISH METHOD)

Summary of more detailed data shown in tables 19 and 20.

See page 251 for detailed explanation.



Summary of Observations

(Surface Growth Alone)

The following samples showed no growth or traces of growth on all six replicates:

	<u>Manuf.</u>	<u>Designation</u>	<u>Grade</u>
	#13	XXX-13	PBE
	#13	LE-13	FBE

The following sample showed traces or slight growth on all six replicates: #7 XA-324 PBE

The following samples showed slight growth on all six replicates; #6 221-A FBE
#9 6022 PBE
#14 XXXP-26 PBE-P
#35 L FBI

The following samples showed slight or moderate growth on all six replicates: #12 XXX-13 PBE
#16 XXX FBE

The following samples showed moderate growth on all six replicates: #12 LE-13 FBE
#16 L FBI

The following sample showed abundant growth on all six replicates: #7 C-525 FBM

(Surface and Edge Growth)

The following samples showed no growth or traces of growth on all six replicates:

	<u>Manuf</u>	<u>Designation</u>	<u>Grade</u>
	#13	XXX-13	PBE
	#13	LE-13	FBE

The following sample showed traces or slight growth on all six replicates: #35 L FBI

The following sample showed slight growth on all six replicates: #14 XXXP-26 PBE-P



The following sample showed traces, slight or moderate growth on all six replicates:

<u>Manuf.</u>	<u>Designation</u>	<u>Grade</u>
#7	XX-324	PBG

The following samples showed slight or moderate growth on all six replicates:

#6	221-A	FBE
#9	6022	PBE
#12	LE-13	FBE
#16	XXX	PBE
#16	L	FBI

The following sample showed slight, moderate or abundant growth on all six replicates:

#12	XXX-13	PBE
-----	--------	-----

The following sample showed abundant growth on all six replicates:

#7	C-525	FBM
----	-------	-----



FUNGINERTNESS OF PLASTIC LAMINATES
(HUMIDITY-EXPOSURE METHOD)

Introduction

Work during this period has been the testing of 34 additional plastic laminated materials for fungus resistance, following the Humidity-Exposure Method as outlined in paragraph 4.2 of "Draft of BuOrd Specification 52T15 (Ord), rev. draft, Rele, of 15 August 1950", furnished by the Bureau of Ordnance with letter dated 17 January 1951. Earlier work covering this phase of the study was reported in the Second Quarterly Report (pages 78-120) and the Third Quarterly Report (pages 137 - 201).

Materials

The materials evaluated in this study include the following laminated, thermosetting, plastic materials as approved under the following specifications:

<u>Specification</u>	<u>Type</u>	<u>Filler</u>	<u>Resin</u>	<u>Grade</u>
MIL-P-997A	GSG	Glass Cloth	Silicone	General
MIL-P-15037A	GMG	Glass Cloth	Melamine	General
MIL-P-15047A	NPG	Nylon Cloth	Phenolic	General
MIL-P-3115A	PBG	Paper	Phenolic	General
MIL-P-3115A	PBE	Paper	Phenolic	Electrical
MIL-P-3115A	PBE-P	Paper	Phenolic	Electrical; Punching
MIL-P-15035A	FBM	Cotton Fab.	Phenolic	Mechanical
MIL-P-15035A	FBG	Cotton Fab.	Phenolic	General
MIL-P-15035A	FBE	Cotton Fab.	Phenolic	Electrical
MIL-P-15035A	FBI	Cotton Fab.	Phenolic	Fine Machining.



Experimental Procedure

The experimental procedure has been explained in detail in the Second Quarterly Report, pages 78 through 81.

Evaluation of Results

At the end of the incubation period the watch glass was removed and the rack taken out of the jar. The separate pieces of string (controls) were examined for fungus growth (visible to the naked eye). All of the controls included in this set of tests developed profuse fungus growth.

Each of the 4 specimens, exposed without attached cotton string, was examined (with the aid of a 7X "Flash-O-Lens" magnifier) for fungus growth. The percentage of area covered by fungus growth was noted for each of the two surfaces, two side edges, top edge, and bottom edge.

Each of the 4 specimens, exposed with attached cotton string was examined for fungus growth (visible to the naked eye) extending from the cotton string. The maximum extent of the fungus growth from point of contact with the string was noted for each of two surfaces and each of the two side edges, of each specimen.

Table 22 pages 267 through 300, lists the observations on the individual replicates.



Interpretation of Results for Determination of Funginertness

For a material to be considered funginert it shall not support fungus growth; this shall be due to absence of nutritive substances in the material and not to presence of a fungistatic agent. The absence of a fungistatic agent was determined by the fungus growth extending from the cotton string on those replicates exposed with string attached.

On the basis of the percentage of area covered by fungus growth on four of the eight specimens and the extent of fungus growth from a known nutrient source on the remaining four of the eight specimens for each sample of plastic laminate being evaluated, the following criteria were used for the various degrees of fungus resistance:

- 1) FUNGINERT - where none of the replicates, exposed without attached cotton string, shows more than 2% fungus growth and where fungus growth extends at least 1 mm from the string on at least 2 of the 4 replicates exposed with cotton string attached.
- 2) FUNGISTATIC - where none of the replicates, exposed without attached cotton string, shows more than 2% fungus growth and where fungus growth does not extend at least 1 mm from the string on at least 2 of the 4 replicates exposed with cotton string attached.
- 3) FUNGUS SUSCEPTIBLE - where at least one of the four replicates, exposed without attached cotton string, shows more than 2% fungus growth.

In table 22, pages 267 through 300 are listed the ratings for the 34 plastic laminated materials reported in this section. A separate page has been set aside for each



sample and each page presents both the original data and the fungus resistance rating both for surface growth and for edge growth. The Humidity-exposure Method permits a separate evaluation based on the edge growth alone, hence the separate ratings. In this method the edge growth is true edge growth in contrast to the Petri-dish Method where edge growth could in reality be deriving its nourishment from the agar and merely extending over the edges of the specimen.



TABLE 22

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBE Manufacturer and Designation: #6

221-A

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth				
			2 sides	Top	Bottom		
1057	Traces	< 2%	Traces	Traces	Moderate	< 2%	
1058	Traces	< 2%	Traces	Traces	Traces	< 2%	
1059	Traces	< 2%	Traces	Traces	Moderate	< 2%	
1060	Traces	< 2%	Traces	Traces	Traces	< 2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
1061	3 mm	1 mm
1062	5 mm	2 mm
1063	3 mm	1 mm
1064	4 mm	1 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert

TABLE 22 (CONTINUED)

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FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBG Manufacturer and Designation: #7

XX-324

Specimens without strings attached:

Replicate	Growth on Surface		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth			
			2 sides	Top	Bottom	
953	Traces	< 2%	Slight	Slight	Moderate	2%
954	Traces	< 2%	Slight	Traces	Slight	2%
955	Slight	2%	Slight	Moderate	Moderate	2%
956	Traces	< 2%	Slight	Slight	Moderate	2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
957	4 mm	2 mm
958	5 mm	3 mm
959	5 mm	2 mm
960	3 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Fungi-nert

Based on Edges alone: Fungi-nert

TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBM Manufacturer and designation: #7 C-525

Specimens without strings attached:

Replicate	Growth on Surface		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth		Bottom	
			2 sides	Top		
1009	Moderate	60%	Moderate	Moderate	Moderate	50%
1010	Abundant	80%	Moderate	Abundant	Abundant	70%
1011	Abundant	75%	Abundant	Moderate	Moderate	75%
1012	Abundant	85%	Abundant	Moderate	Moderate	75%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
1013	8 mm	3 mm
1014	7 mm	2 mm
1015	12 mm	4 mm
1016	7 mm	5 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



Sheet 4 of 34

TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE Manufacturer and Designation: #9 6022

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth			
			2 sides	Top	Bottom	
961	Traces	< 2%	Traces	Traces	Slight	< 2%
962	Traces	< 2%	Traces	Traces	Slight	< 2%
963	Traces	< 2%	Traces	Traces	Slight	< 2%
964	Traces	< 2%	Traces	Traces	Slight	< 2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
965	5 mm	4 mm
966	6 mm	4 mm
967	6 mm	4 mm
968	6 mm	3 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



TABLE 22 (CONTINUED)
FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBM Manufacturer and Designation: #10 C-30

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
777	Moderate	60%	Moderate	Moderate	Moderate	35%
778	Moderate	65%	Moderate	Moderate	Moderate	30%
779	Moderate	45%	Moderate	Moderate	Moderate	35%
780	Moderate	70%	Moderate	Moderate	Moderate	35%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
781	5 mm	4 mm
782	5 mm	4 mm
783	7 mm	3 mm
784	3 mm	3 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)
FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBG Manufacturer and Designation: #10 CE-34

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
825	Moderate	5%	Moderate	Slight	Moderate	15%
826	Moderate	15%	Moderate	Moderate	Slight	10%
827	Moderate	15%	Moderate	Moderate	Moderate	40%
828	Moderate	20%	Moderate	Moderate	Moderate	25%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
829	7 mm	4 mm
830	3 mm	4 mm
831	8 mm	4 mm
832	3 mm	8 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBI Manufacturer and Designation: #10 L-40

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
873	Moderate	10%	Moderate	Moderate	Moderate	10%
874	Moderate	5%	Moderate	Moderate	Moderate	10%
875	Moderate	5%	Slight	Slight	Slight	2%
876	Moderate	5%	Slight	Moderate	Moderate	5%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
877	2 mm	4 mm
878	3 mm	2 mm
879	1 mm	1 mm
880	1 mm	1 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBG Manufacturer and Designation: #11 210

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
785	Moderate	5%	Moderate	Moderate	Moderate	40%
786	Moderate	10%	Moderate	Moderate	Moderate	15%
787	Moderate	20%	Moderate	Moderate	Moderate	35%
788	Moderate	20%	Moderate	Moderate	Moderate	30%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
789	8 mm	7 mm
790	11 mm	8 mm
791	7 mm	6 mm
792	10 mm	3 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE Manufacturer and Designation: #11

215

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
835	Moderate	5%	Slight	Moderate	Slight	2%
834	Slight	2%	Slight	Slight	Slight	2%
835	Slight	2%	Slight	Slight	Moderate	2%
836	Traces	< 2%	Traces	Traces	Traces	< 2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
837	4 mm	7 mm
838	5 mm	2 mm
839	6 mm	6 mm
840	4 mm	4 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Funginert

TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: GSG Manufacturer and Designation: #12 GB-112S

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
793	None	.0%	Traces	None	Traces	< 2%
794	Traces	< 2%	None	None	None	0%
795	Traces	< 2%	None	None	Traces	< 2%
796	None	0%	Traces	None	Traces	< 2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
797	2 mm	3 mm
798	2 mm	1 mm
799	2 mm	2 mm
800	1 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: CMG Manufacturer and Designation: #12 GB 128M

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
801	Moderate	5%	Moderate	Moderate	Moderate	10%
802	Moderate	5%	Moderate	Moderate	Moderate	10%
803	Moderate	10%	Moderate	Moderate	Moderate	15%
804	Moderate	5%	Moderate	Moderate	Moderate	5%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
805	7 mm	7 mm
806	2 mm	3 mm
807	3 mm	4 mm
808	4 mm	5 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: NPG Manufacturer and Designation: #12 MEC-5

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
881	Slight	2%	Slight	Slight	Slight	2%	
882	Slight	2%	Slight	Slight	Slight	2%	
883	Traces	< 2%	Traces	Traces	Slight	< 2%	
884	Slight	2%	Slight	Slight	Slight	2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
885	1 mm	1 mm
886	1 mm	3 mm
887	1 mm	1 mm
888	1 mm	1 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade PBG Manufacturer and Designation: #12 XX-13

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
889	Slight	2%	Traces	Traces	Moderate	< 2%
890	Traces	< 2%	Traces	Traces	Slight	< 2%
891	Slight	2%	Traces	Traces	Moderate	< 2%
892	Traces	< 2%	Traces	Traces	Slight	< 2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
893	2 mm	2 mm
894	2 mm	1 mm
895	1 mm	1 mm
896	3 mm	3 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE Manufacturer and Designation: #12 XXX-13

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
1041	Traces	< 2%	Traces	Traces	Traces	< 2%	
1042	Traces	< 2%	Traces	Traces	Traces	< 2%	
1043	Traces	< 2%	Traces	Traces	Moderate	< 2%	
1044	Traces	< 2%	Traces	Traces	Traces	< 2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
1045	1 mm	2 mm
1046	3 mm	2 mm
1047	3 mm	2 mm
1048	2 mm	2 mm

Rating (See pages 264 through 266 for explanation:)

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE-P Manufacturer and Designation: #12 XXXP-2G

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
841	Slight	2%	Slight	Slight	Moderate	2%	
842	Moderate	5%	Moderate	Slight	Moderate	5%	
843	Moderate	5%	Slight	Slight	Moderate	2%	
844	Moderate	5%	Slight	Slight	Slight	2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
845	8 mm	4 mm
846	3 mm	4 mm
847	11 mm	4 mm
848	3 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBM Manufacturer and Designation: #12 C-1513

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
897	Moderate	50%	Moderate	Moderate	Moderate	25%
898	Moderate	40%	Moderate	Moderate	Moderate	25%
899	Moderate	35%	Moderate	Moderate	Moderate	25%
900	Moderate	55%	Moderate	Moderate	Moderate	50%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
901	8 mm	3 mm
902	3 mm	2 mm
903	2 mm	2 mm
904	4 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBG Manufacturer and Designation: #12 C-813

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
809	Abundant	75%	Moderate	Moderate	Moderate	40%
810	Abundant	75%	Abundant	Moderate	Moderate	75%
811	Moderate	65%	Moderate	Moderate	Moderate	65%
812	Abundant	75%	Moderate	Moderate	Moderate	45%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
813	3 mm	3 mm
814	5 mm	3 mm
815	2 mm	3 mm
816	8 mm	4 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBG Manufacturer and Designation: #13 C-813

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
857	Moderate	15%	Moderate	Slight	Moderate	5%
858	Moderate	5%	Moderate	Moderate	Moderate	5%
859	Moderate	10%	Moderate	Moderate	Moderate	15%
860	Moderate	5%	Moderate	Moderate	Slight	10%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
861	3 mm	3 mm
862	3 mm	2 mm
863	3 mm	2 mm
864	2 mm	1 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBI Manufacturer and designation: #13 L-400

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
817	Moderate	65%	Moderate	Moderate	Abundant	55%
818	Moderate	30%	Moderate	Moderate	Moderate	20%
819	Moderate	65%	Moderate	Moderate	Moderate	35%
820	Moderate	35%	Moderate	Moderate	Moderate	25%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
821	7 mm	3 mm
822	5 mm	3 mm
823	6 mm	4 mm
824	3 mm	7 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE-P Manufacturer and designation: #14 XXXP-26

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
929	Moderate	5%	Slight	Traces	Moderate	2%	
930	Slight	2%	Traces	Traces	Slight	< 2%	
931	Slight	2%	Slight	Traces	Moderate	2%	
932	Slight	2%	Slight	Traces	Slight	2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
933	7 mm	4 mm
934	4 mm	3 mm
935	3 mm	6 mm
936	3 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Funginert



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: GSG Manufacturer and Designation: #15 GSC

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
865	None	0%	None	None	Traces	< 2%	
866	None	0%	None	None	None	0%	
867	Traces	< 2%	Traces	None	Traces	< 2%	
868	None	0%	None	None	None	0%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
869	2 mm	2 mm
870	2 mm	1 mm
871	2 mm	1 mm
872	3 mm	1 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: GMG Manufacturer and Designation: #15

G-5

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
913	Moderate	5%	Moderate	Moderate	Moderate	5%
914	Moderate	5%	Moderate	Slight	Slight	5%
915	Moderate	5%	Slight	Slight	Moderate	5%
916	Moderate	5%	Moderate	Slight	Moderate	5%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
917	2 mm	1 mm
918	1 mm	1 mm
919	3 mm	4 mm
920	2 mm	1 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



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TABLE 22. (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: NPG Manufacturer and Designation: #15 NS

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
921	Traces	< 2%	Traces	Traces	Slight	< 2%
922	Traces	< 2%	Slight	Traces	Moderate	2%
923	Slight	2%	Slight	Traces	Moderate	2%
924	Slight	2%	Slight	Traces	Slight	2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
925	4 mm	4 mm
926	9 mm	4 mm
927	3 mm	3 mm
928	11 mm	6 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBG Manufacturer and Designation: #15 XX

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth				
			2 sides	Top	Bottom		
849	Traces	< 2%	Traces	None	Traces	< 2%	
850	Traces	< 2%	None	None	Traces	< 2%	
851	Traces	< 2%	Traces	Traces	Slight	< 2%	
852	Traces	< 2%	None	None	Traces	< 2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from point of Contact with String	
	Surfaces	Side Edges
853	11 mm	6 mm
854	4 mm	3 mm
855	7 mm	8 mm
856	5 mm	5 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE Manufacturer and Designation: #15 XXX

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			
	Relative Profusion	% of area covered	Relative Brofusion of Growth:			% of area covered
			2 sides	Top	Bottom	
969	Traces	< 2%	Traces	Traces	Slight	< 2%
970	Traces	< 2%	Slight	Slight	Moderate	2%
971	Traces	< 2%	Slight	Traces	Moderate	2%
972	Traces	< 2%	Slight	Slight	Moderate	2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
973	2 mm	1 mm
974	4 mm	2 mm
975	2 mm	3 mm
976	4 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBE-P Manufacturer and Designation: #15 XXXP

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
905	Slight	2%	Traces	Traces	Traces	< 2%	
906	Slight	2%	Traces	Traces	Traces	< 2%	
907	Slight	2%	Slight	Traces	Moderate	2%	
908	Slight	2%	Traces	Traces	Moderate	< 2%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
909	3 mm	2 mm
910	3 mm	2 mm
911	3 mm	2 mm
912	3 mm	4 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBM Manufacturer and Designation: #15

G

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
937	Moderate	20%	Moderate	Moderate	Moderate	30%	
938	Moderate	25%	Moderate	Moderate	Moderate	25%	
939	Moderate	30%	Moderate	Moderate	Moderate	40%	
940	Moderate	25%	Moderate	Moderate	Moderate	30%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
941	2 mm	3 mm
942	2 mm	1 mm
943	2 mm	2 mm
944	3 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBG Manufacturer and Designation: #15 CE

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered	
	Relative Profusion	% of area covered	Relative Profusion of Growth:				
			2 sides	Top	Bottom		
977	Moderate	20%	Moderate	Moderate	Moderate	25%	
978	Moderate	30%	Moderate	Moderate	Moderate	25%	
979	Moderate	30%	Moderate	Moderate	Moderate	30%	
980	Moderate	20%	Moderate	Moderate	Moderate	25%	

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
981	2 mm	1 mm
982	2 mm	1 mm
983	2 mm	1 mm
984	6 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBE Manufacturer and Designation: #15

LE

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growths			
			2 sides	Top	Bottom	
1017	Moderate	40%	Moderate	Moderate	Moderate	30%
1018	Moderate	35%	Moderate	Moderate	Moderate	35%
1019	Moderate	50%	Moderate	Moderate	Moderate	20%
1020	Moderate	25%	Moderate	Moderate	Slight	25%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
1021	2 mm	2 mm
1022	2 mm	1 mm
1023	1 mm	1 mm
1024	4 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES

(HUMIDITY EXPOSURE METHOD)

Grade: FBI Manufacturer and Designation: #15

L

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
945	Moderate	30%	Moderate	Moderate	Moderate	25%
946	Moderate	15%	Moderate	Moderate	Moderate	35%
947	Moderate	30%	Moderate	Moderate	Moderate	30%
948	Moderate	20%	Moderate	Moderate	Moderate	35%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
949	3 mm	4 mm
950	2 mm	2 mm
951	4 mm	2 mm
952	4 mm	2 mm

Rating (See pages 264 through 266 for explanations.)

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible

TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: PBG Manufacturer and Designation: #16 XX

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
985	Traces	< 2%	Traces	Traces	Moderate	< 2%
986	Traces	< 2%	Traces	Traces	Slight	< 2%
987	Traces	< 2%	Traces	Traces	Slight	< 2%
988	Slight	2%	Slight	Traces	Moderate	2%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
989	3 mm	2 mm
990	2 mm	1 mm
991	2 mm	1 mm
992	6 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Funginert

Based on Edges alone: Funginert



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TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBM Manufacturer and Designation: #16

C

Specimens without strings attached:

Replicate	Growth on Surfaces		Growth on Edges			% of area covered
	Relative Profusion	% of area covered	Relative Profusion of Growth:			
			2 sides	Top	Bottom	
1025	Moderate	35%	Moderate	Moderate	Moderate	20%
1026	Moderate	70%	Moderate	Moderate	Moderate	30%
1027	Moderate	65%	Moderate	Moderate	Moderate	40%
1028	Moderate	60%	Moderate	Moderate	Moderate	30%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
1029	2 mm	1 mm
1030	2 mm	2 mm
1031	4 mm	1 mm
1032	5 mm	2 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible

TABLE 22 (CONTINUED)

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

Grade: FBE Manufacturer and Designation: #16 LE

Specimens without strings attached:

Replicate	Growth on Surfaces			Growth on Edges		
	Relative Profusion	% of area covered	Relative Profusion of Growth:			% of area covered
			2 sides	Top	Bottom	
993	Moderate	35%	Moderate	Moderate	Moderate	25%
994	Moderate	25%	Moderate	Moderate	Moderate	30%
995	Moderate	35%	Moderate	Moderate	Moderate	30%
996	Moderate	30%	Moderate	Moderate	Moderate	25%

Specimens with strings attached:

Replicate	Maximum Extent of Fungus Growth from Point of Contact with String	
	Surfaces	Side Edges
997	3 mm	2 mm
998	4 mm	2 mm
999	4 mm	2 mm
1000	6 mm	3 mm

Rating (See pages 264 through 266 for explanation):

Based on surfaces alone: Susceptible

Based on Edges alone: Susceptible

TABLE 23

FUNGUS RESISTANCE OF PLASTIC LAMINATES
(HUMIDITY EXPOSURE METHOD)

(Summary of ratings listed in table 22)

<u>Spec. Grade</u>	<u>Manufacturer and Designation</u>	<u>Surface Rating</u>	<u>Edge Rating</u>
FBE	#6	221-A	Funginert
PBG	#7	XX-324	Funginert
FBM	#7	C-525	Susceptible
PBE	#9	6022	Funginert
FBM	#10	C-30	Susceptible
FBG	#10	CE-34	Susceptible
FBI	#10	L-40	Susceptible
PBG	#11	210	Susceptible
PBE	#11	215	Susceptible
GSG	#12	GB-112S	Funginert
GMG	#12	GB-128M	Susceptible
NPG	#12	MEC-5	Funginert
PBG	#12	XX-13	Funginert
PBE	#12	XXX-13	Funginert
PBE-P	#12	XXXP-26	Susceptible
FBM	#12	C-L513	Susceptible
FBG	#12	C-813	Susceptible
FBG	#13	C-813	Susceptible
FBI	#13	L-400	Susceptible
PBE-P	#14	XXXP-26	Susceptible
GSG	#15	GSC	Funginert
GMG	#15	G-5	Susceptible
NPG	#15	NS	Funginert
PBG	#15	XX	Funginert
PBE	#15	XXX	Funginert
PBE-P	#15	XXXP	Funginert
FBM	#15	C	Susceptible
FBG	#15	CE	Susceptible
FBE	#15	LE	Susceptible
FBI	#15	L	Susceptible
PBG	#16	XX	Funginert
FBM	#16	C	Susceptible
FBE	#16	LE	Susceptible
PBG	#17	300	Funginert



Summary of Observations

(Surface Growth)

The following samples showed growth covering 2% or less of the area on all 4 replicates.	Manuf.	Designation	Grade
	#6	221-A	FBE
	#7	XX-324	PBG
	#9	6022	PBE
(These samples also showed a minimum of 1 mm growth from string on replicates exposed with string attached)	#12	GB-112S	GSG
	#12	MEC-5	NPG
	#12	XX-13	PBG
	#12	XXX-13	PBE
	#15	GSC	GSG
	#15	NS	NPG
	#15	XX	PBG
	#15	XXX	PBE
	#15	XXXP	PBE-P
	#16	XX	PBG
	#17	300	PBG
The following samples showed growth covering 2 - 10% of the area on all 4 replicates:			
	#10	L-40	FBI
	#11	215	PBE
	#12	GB-128M	GMG
	#12	XXAP-26	PBE-P
	#13	C-813	FBG
	#14	XXXP-26	PBE-P
	#15	Ge5	GMG
The following samples showed growth covering 10-40% of the area on all 4 replicates:			
	#10	CE-34	FBG
	#11	210	PBG
	#15	C	FBM
	#15	CE	FBG
	#15	LE	FRE
	#15	L	FBI
	#16	LE	FBE
The following samples showed growth covering 30 - 80% of the area on all 4 replicates:			
	#7	C-525	FBM
	#10	C-30	FBM
	#12	C-1513	FBM
	#13	L-400	FBI
	#16	C	FBM
The following sample showed growth covering 65% or over of the area on all 4 replicates:			
	#12	C-813	FBG



Summary of Observations

(Edge Growth)

The following samples showed growth covering 2% or less of the area on all 4 replicates:

(These samples also showed a minimum of 1 mm growth from string on replicates exposed with string attached)

<u>Manuf.</u>	<u>Designation</u>	<u>Grade</u>
#6	221-A	FBE
#7	XX-324	PBG
#9	6022	PBE
#11	215	PBE
#12	GB-112S	GSG
#12	MEC-5	NPG
#12	XX-13	PBG
#12	XXX-13	PBE
#14	XXA-P-26	PBE-P
#15	GSC	GSG
#15	NS	NPG
#15	XX	FBG
#15	XXX	PBE
#15	XXX-P	PBE-P
#16	XX	PBG

The following samples showed growth covering 2 - 10% of the area on all 4 replicates:

#10	L-40	FBI
#12	GB-128M	GMG
#12	XXXP-26	PBE-P
#13	C-815	FBG
#15	-5	GMG

The following samples showed growth covering 10-40% of the area on all 4 replicates:

#10	C-30	FBM
#10	CE-34	FBG
#11	210	PBG
#15	C	FBM
#15	CE	FBG
#15	LE	FBG
#15	L	FBI
#16	C	FBM
#16	LE	FBE
#17	300	PBG

The following samples showed growth covering 30-80% of the area on all 4 replicates:

#7	C-525	FBM
#12	C-1513	FBM
#12	C-813	FBG
#13	L-400	FBI



FUNGINERTNESS OF THE THERMOSETTING MOLDED PLASTICS

(PETRI-DISH METHOD)

Introduction

During the period covered by this Fourth Report, a number of additional available thermosetting molded plastics were tested for funginertness following the Petri-dish culture test procedure as outlined in the "Funginertness Requirement and Test, for use in MIL-I-631A" (as completed 29 January 1951), furnished by the Bureau of Ordnance with letter dated 16, February 1951. Earlier work covering this phase of the study was reported in the Third Quarterly Report (pages 202-244).

Materials

The plastics evaluated in this study include the following thermosetting molded plastics as approved under MILITARY SPECIFICATION MIL-P-14B:

Phenolic Resin:

Type CFG - Cellulose filler, general-purpose.

Type CFI-5-Cellulose filler, impact-resistant; nominal impact strength, 0.60 foot-pounds per inch notch.

Type CFI-10-Cellulose filler, impact-resistant; nominal impact strength, 1.0 foot-pounds per inch notch.

Type CFI-20-Cellulose filler, impact-resistant; nominal impact strength, 2.0 foot-pounds per inch notch.

Type CFI-30-Cellulose filler, impact-resistant; nominal impact strength, 3.0 foot-pounds per inch notch.



Type CFI-40-Cellulose filler, impact-resistant; nominal impact strength, 4.0 foot-pounds per inch notch.

Type MFE - Mineral filler, best electrical properties.

Type MFG - Mineral filler, general-purpose, heat-resistant.

Type MFH - Mineral filler, heat-resistant.

Type MFI-10-Mineral filler, impact resistant; nominal impact strength, 1.0 foot-pounds per inch notch.

Type MFI-20-Mineral filler, impact resistant; nominal impact strength, 2.0 foot-pounds per inch notch.

Melamine Resin:

Type CMG - Cellulose filler, general-purpose.

Type CMI-5= Cellulose filler, impact-resistant; nominal impact strength, 0.60 foot-pounds per inch notch.

Type MME - Mineral filler, arc- and flame-resistant.

Alkyd Resin:

Type MAG - Mineral filler, general-purpose alkyd resin.

Experimental Procedure

The experimental procedure used was the same as that used in the Petri-dish funginertness tests of plastic laminates except for the test specimens used. The details of this procedure are found in the First Quarterly Report of this series. (See pages 5, 6, and 7.)

The specimens used in these tests were prepared as follows. The thermosetting molding plastic, being tested, was molded into discs of 1/8" thickness in such diameters as to



allow subsequent cutting of squares 1 inch by 1 inch from the discs. This cutting was done using an 8" arbor tilt saw equipped with a suitable cutting blade.

The resulting specimens (1/8" x 1" x 1") were then handled in the same manner as the plastic laminate specimens.

Evaluation of Results

At the end of the 21 day incubation period, each specimen was examined separately for growth on the surface and for growth on the cut edges and rated as follows:

Observed Fungus growth on
the specimen

	<u>Rating</u>
No growth	0
Traces of growth (*)	1
Slight to moderate growth: partial coverage	2
Moderate growth: considerable coverage	3
Abundant growth: complete coverage	4

(*) Traces of growth are defined as scattered, sparse fungus growth such as might develop from an unusual mass of spores in the original inoculum, or upon an occasional extraneous bit of debris. (Continuous cobwebby growth extending over the entire surface or edge of the specimen, even though not necessarily obscuring the specimen, was rated as 2.)

Table 24, pages 308 through 310, lists the observations on the individual replicates of the unconditioned specimens and numeric rating of each replicate both for surface and edge growth. Table 25, pages 311 through 313, lists the observations on the individual replicates of the conditioned specimens and the numeric rating of each replicate both for surface and edge growth.



Interpretation of Results for Determination of Funginertness

For a material to be considered funginert it shall not support fungus growth; this shall be due to absence of nutritive substances in the material and not to presence of a fungistatic agent. The absence of a fugitive fungistatic agent was determined from the results on the specimens which received the conditioning of 6 hours at 85° C.

On the basis of the numeric rating of the fungus growth on the six specimens for each sample of plastic being evaluated, the following criteria were used for the various degrees of fungus resistance:

- 1) Funginert - where at least 2 of 3 specimens were rated 0 or 1 when tested as received and at least 2 of 3 specimens were rated 0 or 1 when tested after being conditioned.
- 2) Fugitive Fungistatic - where at least 2 of 3 specimens were rated 0 or 1 when tested as received and at least 2 of 3 specimens were not rated 0 or 1 when tested after being conditioned.
- 3) Fungus Susceptible - where at least 2 of 3 specimens were not rated 0 or 1 when tested as received and at least 2 of 3 specimens were not rated 0 or 1 when tested after being conditioned.

Since it has not been determined whether these criteria will be applied to surface growth alone or to surface growth together with edge growth, separate ratings have been assigned to the specimens based on surface growth alone and on surface and edge growth considered together.

Table 26, pages 314 and 315, lists the classification, of the molded plastics tested, based on the rating considering surface growth alone and on the ratings considering surface growth together with edge growth.

Sheet 1 of 3

TABLE 24
GROWTH OF FUNGUS ON MOLDED PLASTICS
(PETRI-DISH METHOD)

Conditioning of Specimen: None

Spec. Grade	Manufacturer and Designation	Petri-dish Repli-cates	Description of Fungus Growth		Numeric Rating
			Surface	Edges (**)	
CFI 20	#12 20 Natural	614A 614B 614C	Abundant {**} Abundant {**} Abundant {**}	Abundant Abundant Abundant	4 4 4
CFG	GP- 130 Nat.	598A 598B 598C	Slight {*} Slight {*} Slight	Slight Slight Slight	2 2 2
CFG	#21 GP- 130 Brown	599A 599B 599C	Slight {*} Mod: Part Cov {*} Mod: Part Cov {*}	Slight Slight Slight	2 2 2
CFI 5	#21 IM-510 Natural	611A 611B 611C	Slight Slight Traces (*)	Slight Slight Traces	2 2 1
CFI 5	#21 IM-510 Brown	612A 612B 612C	Mod: Part Cov Slight Slight	Moderate Traces Slight	2 2 2

* - Specimen surface was waterlogged ** Same for 4 edges unless otherwise noted
 Note - For explanation of numeric rating see page 306.

TABLE 24 (CONTINUED)

Sheet 2 of 2

GROWTH OF FUNGUS ON MOLDED PLASTICS
(PETRI-DISH METHOD)

Conditioning of Specimen: None

Spec. Grade	Manufacturer and Designation	Petri-dish Repli-cates	Description of Fungus Growth		Numeric Rating Surface and Edges
			Surface	Edges (**)	
CFI 5	#21 IM-510 Black	613A 613B 613C	Complete waterlog traces {**}	Waterlog Slight Slight	0 1 1
MFG	#21 HR-350 Natural	609A 609B 609C	Slight (*) Slight Slight	Slight Slight Slight	23 23 23
MFG	#21 HR- 350 Brown	610A 610B 610C	Slight (*) Slight Slight	Moderate Slight Traces	22-23 23
MFH	#21 HR-340 Natural	607A 607B 607C	Slight (*) Slight (*) Slight (*)	Slight Slight Slight	23 23 23
MFH	#21 HR-340 Brown	608A 608B 608C	Slight (*) Slight (*) Slight (*)	Slight Slight Slight	23 23 23

* Specimen surface was waterlogged ** Same for 4 edges unless otherwise noted.
 Note - For explanation of numeric rating see page 206.



TABLE 24 (CONCLUDED)
GROWTH OF FUNGUS ON MOLDED PLASTICS
(PETER LI-DISH METHOD)

Condition of Specimen: None

- Specimen surface was waterlogged - Same for 4 edges unless otherwise noted
Note - For examination of numeric rating code see page 306.

TABLE 25

GROWTH OF FUNGUS ON MOLDED PLASTICS
(PETRI-DISH METHOD)

Conditioning of Specimen: 6 hrs at 85° C.

Sheet 1 of 3

Spec. Grade	Manufacturer and Designation	Petri- dish Repli- cates	Description of Fungus Growth		Numeric Rating Surface and Edges
			Surface	Edges (**)	
CFI 20	#12 20 Natural	622A 622B 622C	Abundant (*) Abundant (*) Abundant	Abundant Abundant Abundant	4 4 4
CPG	#21 GP -130 Natural	605A 605E 605C	Slight (*) Slight (*) Slight	Slight Slight Slight	2 2 2
CFG	#21 GP-130 Brown	606A 606B 606C	Slight (*) Slight Slight	Slight Slight Slight	2 2 2
CFI 5	#21 IM 510 Natural	619A 619B 619C	Slight (*) Slight (*) Slight (*)	Slight Slight Slight	2 2 2
CFI 5	#21 IM 510 Brown	620A 620B 620C	Slight (*) Slight (*) Slight (*)	Slight Slight Moderate	2 2 2

* Specimen surface was waterlogged ** Same for 4 edges unless otherwise noted
 Note—For explanation of numeric rating code see page 365

TABLE 25 (CONTINUED)
GROWTH OF FUNGIUS ON MOLDED PLASTICS
(PETRI-DISH METHOD)

Conditioning of Specimen: 6 hrs at 85° C

Spec. Grade	Manufacturer and Designation	Description of Fungiuss Growth			Numeric Rating
		Petri-dish Replicates	Surface	Edges (**)	
CFI 5	#21 TM-510 Black	621A 621B 621C	Slight (*) Slight (*) Slight	Slight Slight Slight	6 63 62
MFG	#21 HR-350 Natural	617A 617B 617C	Complete Waterlog Slight (*) Traces (*)	Waterlog Slight Slight	0 62 1
MFG	#21 HR-350 Brown	618A 618B 618C	Slight (*) Slight (*) Traces (*)	Slight Slight Slight.	62 62 64
MFH	#21 HR-340 Natural	615A 615B 615C	Slight (*) Slight (*) Slight	Slight Slight Slight	62 62 62
MFH	#21 HR-340 Brown	616A 616B 616C	Slight (*) Slight (*) Slight	Slight Slight Slight	62 62 62

* Specimen surface was waterlogged ** Same for edges unless otherwise stated
Note - For explanation of numeric rating code see page 366

SHEET 1 OF 2

TABLE 26
FUNGUS RESISTANCE OF MOLDED PLASTICS
(PETRI-DISH METHOD)

Summary of more detailed data shown in tables 24 and 25.

Spec. Grade	Manufacturer and Designation	Surface Growth Only				Surface and Edge Growth			
		Unsound	Cond	Numeric Rating	Fungus Resistance (*)	Unsound	Cond	Numeric rating	Fungus Resistance (*)
CFI 20	12 20 Nat	4 4 4	4 4 4	4 4 4	Susceptible	4 4 4	4 4 4	4 4 4	Susceptible
CFG	21 GP-130 Nat	2 2 2	2 2 2	2 2 2	Susceptible	2 2 2	2 2 2	2 2 2	Susceptible
CFG	21 GF-130 Br.	2 2 2	2 2 2	2 2 2	Susceptible	2 2 2	2 2 2	2 2 2	Susceptible
CFI 5	21 IM-510 Nat	2 2 1	2 2 2	2 2 2	Susceptible	2 2 1	2 2 2	2 2 2	Susceptible
CFI 5	21 IM-510 BR	2 2 2	2 2 2	2 2 2	Susceptible	2 2 2	2 2 2	2 2 2	Susceptible
CFI 5	21 IM-510 Bl.	0 1 1	2 2 2	2 2 2	Fungistatic	0 2 2	2 2 2	2 2 2	Susceptible
MFG	21 HR-350 Nat	2 2 2	0 2 1	2 2 1	Susceptible	2 2 2	0 2 2	2 2 2	Susceptible
MFG	21 HR-350 Br.	2 2 2	2 2 1	2 2 1	Susceptible	2 2 2	2 2 2	2 2 2	Susceptible

* See page 307 for more detailed explanation.



TABLE 26 (CONCLUDED)
FUNGUS RESISTANCE OF MOLDED PLAST.
(PETRI-DISH METHOD)

Sheet 2 of 2

Summary of more detailed data shown in tables 24 and 25.

See page 307 for more detailed explanation.



Summary of Observations

(Surface Growth Alone)

The following samples showed traces of growth on all six replicates:

Manuf.	Designation	Grade
#23	420	MAG
#23	422	MAG

The following samples showed traces or slight growth on all six replicates:

#21	IM-510 Nat.	CFI-5
#21	IM-510 Bl.	CFI-5
#21	HR-350 Nat.	MFG
#21	HR-350 Br.	MFG

The following samples showed slight growth on all six replicates:

#21	GP-130 Nat.	CFG
#21	HR-340 Nat.	MFH
#21	HR-340 Br.	MFH

The following samples showed slight or moderate growth on all six replicates:

#21	GP-130 Br.	CFG
#21	IM-510 Br.	CFI-5

The following sample showed abundant growth on all six replicates:

#12	20 Natural	CFI-20
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Summary of Observations

(Surface and Edge Growth)

The following samples showed traces of growth on all six replicates:	Manuf.	Designation	Grade
	#28	420	MAG
	#28	422	MAG
The following samples showed traces or slight growth on all six replicates:	#21 #21 #21	IM-510 Nat. IM-510 Bl. HR-350 Nat.	CFI-5 CFI-5 MFG
The following samples showed slight growth on all six replicates:	#21 #21 #21	GP-130 Nat. HR-340 Nat. HR-340 Br.	CFG MFH MFH
The following samples showed traces, slight or moderate growth on all six replicates:	#21 #21	HR-350 Br. IM-510 Br.	MFG CFI-5
The following sample showed slight or moderate growth on all six replicates:	#21	GP-130 Br.	CFG
The following sample showed abundant growth on all six replicates:	#12	20 Natural	CFI-20



PARTIAL COMPARISON OF RESULTS OBTAINED
BY THE TWO TEST METHODS

A total of 129 plastic laminated materials have been tested for resistance to fungus growth using both the Petri-Dish Method and the Humidity-Exposure Method as supplied by the Bureau of Ordnance. Observations and ratings of the individual replicates of these 129 laminates have been reported on previous pages of this report and in the First, Second and Third Quarterly Reports.

A preliminary comparison of 30 of these 129 laminates has been reported in the Second Quarterly Report, pages 121 and 122. An additional 55 laminates are included in the Third Quarterly report, pages 245 through 247. The additional 34 laminates are included in this report. Table 27, pages 319 lists these additional 34 laminates arranged in decreasing order of fungus resistance, as determined by the Petri-Dish Method, considering surface growth alone. Also listed in table 27, are the corresponding results as obtained using the Humidity-Exposure Method.

This listing has been compiled using results of surface growth alone (on unconditioned specimens) since it is not felt that the edge growth obtained in the Petri-Dish Method is comparable to that obtained in the Humidity-Exposure Method.

No conclusions are being drawn from this listing until all the laminates under test have been reported.



TABLE 27

FUNGUS RESISTANCE OF PLASTIC LAMINATES
AS DETERMINED BY TWO TEST METHODS

Spec. Grade	Manufacturer and Designation	Surface Growth by:			
		Petri-Dish Method		Humidity-Exposure Method	
		Relative Profusion	Rating (*)	Relative Profusion	% of area Covered
GSG	#12 GB-112S	Traces	1	None - Tr.	0%
GSG	#15 GSC	Traces	1	None - Tr.	0%
PBG	#12 XX-13	Traces	1	Tr. - Sl.	1.5%
FBE	#6 221-A	Slight	2	Traces	1%
PBE	#15 XXX	Slight	2	Traces	1%
PBG	#15 XX	Slight	2	Traces	1%
PBE	#9 6022	Slight	2	Traces	1%
PBE	#12 XXX-13	Slight	2	Traces	1%
PBG	#7 XX-324	Slight	2	Traces	1%
NPG	#15 NS	Slight	2	Tr. - Sl.	1.5%
NPG	#12 MEC-5	Slight	2	Tr. - Sl.	1.75%
PBE-P	#15 XXXP	Slight	2	Slight	2%
PBG	#17 300	Slight	2	Slight	2%
PBE	#11 215	Slight	2	Tr. - Mod.	2.5%
PBE-P	#14 XXXP-26	Slight	2	Sl. - Mod.	2.75%
PBE-P	#12 XXXP-26	Slight	2	Sl. - Mod.	4.25%
GMG	#15 G-5	Slight	2	Moderate	5%
FBI	#10 L-40	Slight	2	Moderate	5%
GMG	#12 GB-128M	Slight	2	Moderate	6.25%
PBG	#11 310	Slight	2	Moderate	14%
FBE	#15 LE	Slight	2	Moderate	32.5%
FBG	#13 C-813	Mod: Part Cov	2	Moderate	8.75%
FBG	#10 CE-54	Mod: Part Cov	2	Moderate	14%
FBI	#15 L	Mod: Part Cov	2	Moderate	24%
FBI	#13 L-400	Mod: Part Cov	2	Moderate	50%
FBM	#15 C	Mod: Cons Cov	3	Moderate	25%
FBM	#10 C-30	Mod: Cons Cov	3	Moderate	60%
PBG	#16 XX	Abundant	4	Tr. - Sl.	1%
FBG	#15 CE	Abundant	4	Moderate	25%
FBE	#16 LE	Abundant	4	Moderate	31%
FBM	#12 C-1513	Abundant	4	Moderate	45%
FBM	#16 C	Abundant	4	Moderate	57.5%
FBG	#12 C-813	Abundant	4	Mod. - Abund	72.5%
FBM	#7 C-525	Abundant	4	Mod. - Abund	75%

* - See page 250 for explanation